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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/056,915

01/25/2002

Leroy E. D'Astolfo

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EXAMINER

WILKINS III, HARRY D

ART UNIT

PAPER NUMBER

1742

DATE MAILED: 09/05/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/056,915

Applicant(s)

D'ASTOLFO ET AL.

Examiner

Harry D Wilkins, III

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 January 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Information Disclosure Statement

1. The reference "PERMATECH, Castables for the Aluminum Industry" was provided without a date. Upon searching the Examiner found these materials and the relevant date was found to be December 1996, thus qualifying the art under 35 USC 102(b).

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
3. Claim 16 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
4. Claim 16 recites the limitation "phosphate" in line 1. There is insufficient antecedent basis for this limitation in the claim. The proper antecedent basis is "an oxide of phosphorous" as seen in claim 10.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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6. Claims 1-3, 5-9, 11-15, 17-19 and 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's admission of prior art in view of "Permotech Beta 2HPSL (With Stainless Steel Fibers)" and "Refractories".

Applicant admits as prior art (see paragraph 4) that supports for an anode system in contact with a molten salt bath in an electrolysis apparatus were made from dense castable refractories subject to attack by gases from the bath.

However, Applicant does not admit that the dense castable refractory had a 50-95% theoretical density, with 2-20 wt% metal fibers included therein.

"Permotech Beta 2HPSL (With Stainless Steel Fibers)" teaches an 87-89% theoretical density (11-13% apparent porosity) castable refractory with stainless steel fibers that provides "very good" thermal shock resistance.

"Refractories" teaches stainless steel fibers, (see 3rd paragraph on page 3) preferably 1-3/8" (3.49 cm) in length, for incorporation into a castable refractory that (see figure 2 and 2nd paragraph on page 4), when added at 2-6 wt%, improve the thermal shock resistance of the refractory and, as can be seen in figure 3, have a length to thickness ratio in the range of 500:1 to 20:1. The fibers of "Refractories" are (see 4th-6th paragraphs on page 1) superior to normal fibers because of increased ductility that allow better separation during mixing, thus providing a more uniform composite.

Therefore, it would have been obvious to one of ordinary skill in the art to have incorporated the fiber reinforced castable refractory of Permotech for the prior art anode support because the reinforcement greatly increased the thermal shock resistance of the refractory and it would have been obvious to have used the metal fibers of

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"Refractories" because the fibers provide better mixing properties, thus providing a more uniform composite.

Regarding claim 7, Applicant admits as prior art (see paragraph 4) that support assemblies made from castable refractories for an inert anode system contained at least one inert anode attached to the support system, and the anode and support being in contact with a molten salt bath in an electrolysis apparatus and subject to attack by gases from the bath. Though "Permatest Beta 2HPSL (With Stainless Steel Fibers)" is silent as to the number of fibers protruding from the surface of the support, it was known that HF could corrode the stainless steel. Therefore, it would have been obvious to have reduced the number of fibers protruding from the surface of the support in order to reduce the amount of corrosion of the fibers.

Regarding claim 17, Applicant admits as prior art (see paragraph 4) an electrolytic reduction cell for producing aluminum that includes at least one inert anode attached to a refractory support where the anodes and support are in contact with the molten salt bath.

Regarding claim 23, Applicant admits as prior art (see paragraph 4) an electrolytic process involving attaching at least one inert anode to a refractory support where the anodes and support contact a molten salt bath and where corrosive gases contact the inert anode and the support at (see paragraph 2) temperatures up to 1000°C. Though there is no explicit disclosure of metal being deposited from the molten salt bath, it is implicitly disclosed that aluminum is deposited in the process.

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Regarding claims 2, 8 and 18, the Beta 2HPSL refractory contains about 65.8% alumina.

Regarding claims 3, 9 and 19, the reinforced Beta 2HPSL used stainless steel fibers.

Regarding claims 5, 11 and 21, the metal fibers of "Refractories" have (see figure 4) a "concave cross-section".

Regarding claims 6, 12 and 22, Applicant admits as prior art (see paragraphs 2, 7 and 8) that the electrolyte is cryolite and the operating temperature is about 850-1000°C. The aluminum electrolysis apparatus inherently produces HF and O₂ gas (for support see Li at col. 5, lines 19-25).

Regarding claim 13, "Refractories" teaches adding the fibers (see figure 2) at 2-6 wt%. Beta 2HPSL contains (see Chemical Analysis) 5.1 wt% "Others" (i.e.-filler) and has a maximum use temperature of 1427°C.

Regarding claim 14, the metal fibers of "Refractories" have (see figure 4) a "concave cross-section" and teaches using them (see figure 2) at 2-6 wt%. Beta 2HPSL is 87-89% dense (11-13% porosity).

Regarding claim 15, as can be seen in figure 3 of "Refractories", the fibers have a length to thickness ratio in the range of 100:1 to 50:1.

7. Claims 4, 10, 16 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's admission of prior art in view of "Permtech Beta 2HPSL (With Stainless Steel Fibers)" and "Refractories" as applied to claims 1-3, 5-9, 11-15, 17-19 and 21-23 above, and further in view of Cheyrey et al (US 6,478,867).

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The teachings of Applicant's admission of prior art in view of "Permotech Beta 2HPSL (With Stainless Steel Fibers)" and "Refractories" are described above in paragraph no. 6.

Applicant's admission of prior art in view of "Permotech Beta 2HPSL (With Stainless Steel Fibers)" and "Refractories" do not teach adding a coating to the metal fibers containing an oxide of phosphorous.

Cheyrezy et al teach (see figure 9 and col. 5, line 57-col. 6, line 42) that stainless steel fibers dispersed in a ceramic matrix had been coated with a phosphate (phosphorous oxide) coating in order to increase the fiber/matrix bonding.

Therefore, it would have been obvious to one of ordinary skill in the art to have coated the fibers of "Refractories" with a phosphate coating as taught by Cheyrezy et al because the phosphate coating improved the bonding between the fibers and the ceramic matrix.

Regarding claim 16, while Cheyrezy et al are silent about the thickness of the phosphate coating, it would have been within the expected skill of a routineer in the art to have optimized the coating thickness in order to maximize the increased bonding effect.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry D Wilkins, III whose telephone number is 703-305-9927. The examiner can normally be reached on M-Th 10:00am-8:30pm.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V King can be reached on 703-308-1146. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Harry D Wilkins, III
Examiner
Art Unit 1742

hdw

ROY KING
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